(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) Publication number : **0 448 496 A2**

(12) EUROPEAN PATENT APPLICATION

(21) Application number : **91480029.7**

(51) Int. Cl.^{5} : **G06F 3/033**

(22) Date of filing : **21.02.91**

(30) Priority : **12.03.90 US 492510**

(43) Date of publication of application :
25.09.91 Bulletin 91/39

(84) Designated Contracting States :
DE ES FR GB IT

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(54) Dynamic selective correlation of graphic entities.

(57) System for editing displayed graphic images restricts highlighting only to selected images of a type on which editing is possible or designated. When an edit function is to be executed, a certain image type is specified for editing. A displayed image is selected using a cursor and the normal highlighting that occurs to identify the image being selected is deferred until the system determines that the type of image selected is the certain type specified for editing.

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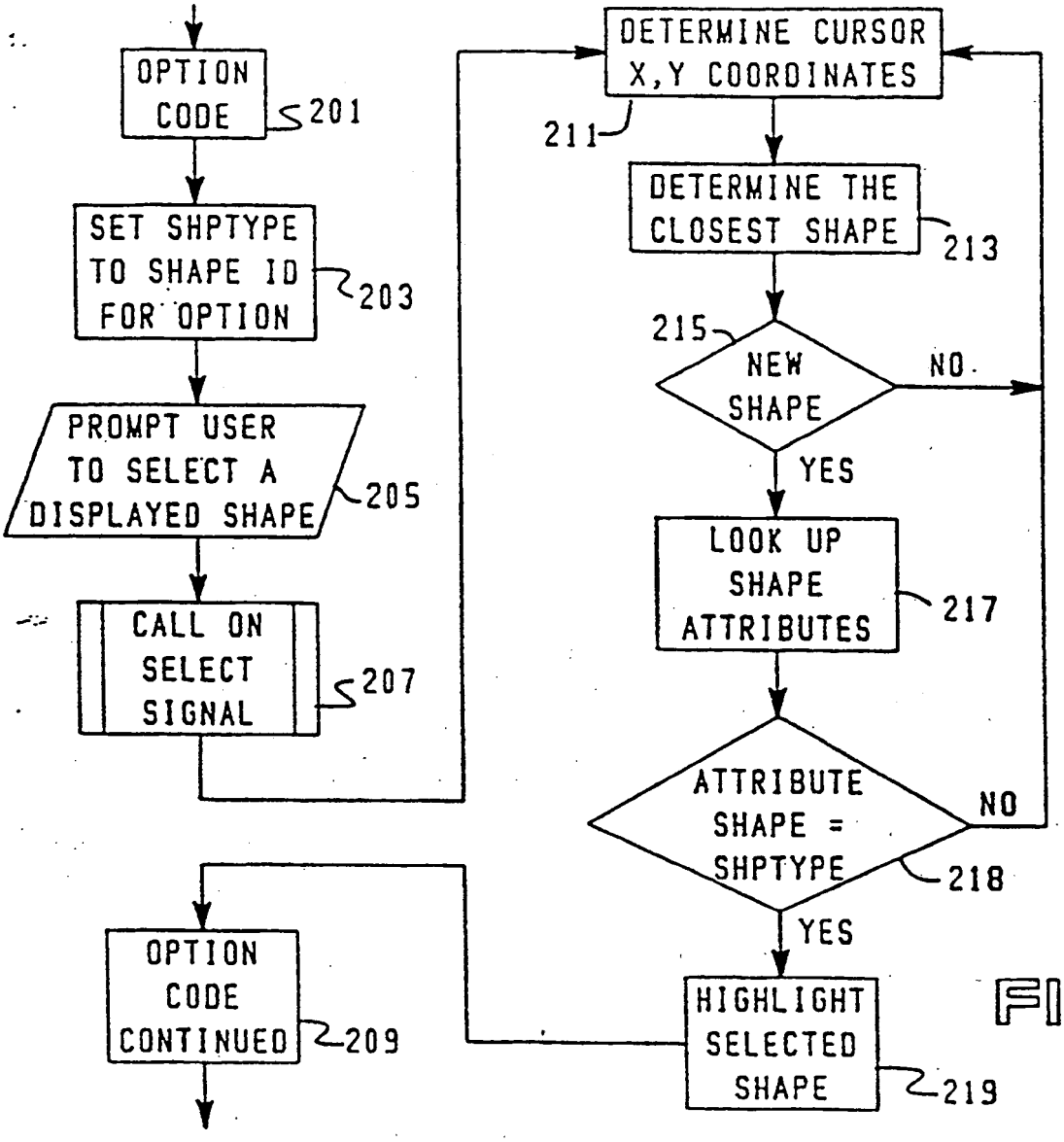
OPTION CODE
201
SET SHPTYPE TO SHAPE ID FOR OPTION
203
PROMPT USER TO SELECT A DISPLAYED SHAPE
205
CALL ON SELECT SIGNAL
207
OPTION CODE CONTINUED
209
DETERMINE CURSOR X,Y COORDINATES
211
DETERMINE THE CLOSEST SHAPE
213
215
NEW SHAPE
NO
YES
LOOK UP SHAPE ATTRIBUTES
217
ATTRIBUTE SHAPE = SHPTYPE
218
NO
YES
HIGHLIGHT SELECTED SHAPE
219

FIG.2

DYNAMIC SELECTIVE CORRELATION OF GRAPHIC ENTITIES

Background of the Invention

This invention relates to selection of a displayed image using a cursor and particularly to energizing a display element to which the control by an input device is directed.

In CAD (Computer Aided Drafting -- or Design) graphic applications, a cursor is used to select entities on a display screen. The selected entity, e.g., a shape such as a box or circle or line, is then highlighted to show the user which entity has been selected. The user can move the cursor about until the desired shape is high-lighted by changing color, intensity, blinking, or altering some other attribute of the selected shape or entity.

Some CAD functions apply only to certain types of entities. For example, when it is desired to modify text, the text to be modified must be selected. Selection of other entities, such as shapes, results in an error message being displayed to the user that an improper entity has been selected, requiring the user to reset the message and select the correct entity, in this case text. The generation and cancellation of the error message and subsequent selection of another entity reduce the productivity of the user.

U.S. Patent 4,516,266 discloses graphics entity detection independent from the image generation. Using a light pen to select a pixel (picture element or dot making up the raster display), the shape of which the pixel is part of can be ascertained and highlighted. This is accomplished by monitoring identifying signals provided with the data being sent serially from storage to the display device. Such identifying signals are associated with the features or entities of which the data is a part.

U.S. Patent 4,742,473 discloses a system for facilitating interaction with a CAD system by allowing the user to select one of a plurality of processing modes from a menu. The input device is a digital tablet and the display has two areas. Alphanumeric data is displayed on a status screen and a cursor controlled by the digital tablet is monitored by a computer which detects when the cursor moves between the graphics work space and the menu region. In response to such determination, the computer displays on the status screen the modes available for selection when entering the menu region and substitutes a mode-dependent status display when the cursor enters the graphic work space.

Present systems select the correlated entity and highlight it for verification before determining whether it is the correct type of entity for the function being executed. As noted above, this wastes time and requires the user to per-form extra operations to restart the selection process.

Summary of the Invention

In accordance with the invention, a display image is selected e.g., using a cursor, for editing by an editing operation that applies only to certain types of images. The certain type of image is an operation attribute, i.e., specified as part of the operation. When the cursor selects an image, its type attribute is checked. If it is the same as the certain type specified by the operation, then the image is highlighted for verification by the user. If it is not the same, then the image is not high-lighted and the user must select another image or the system can select the next nearest shape.

The invention eliminates the need for error messages by associating the type of entity required by the function with the entity correlated with the cursor. If not the same, then the correlated entity is not highlighted and the user moves the cursor until an entity is highlighted, ensuring that the selected entity is the proper for the function. That is, if text is to be modified, then only correlated text entities will be selected and high-lighted.

Another useful application of the invention is in GIS applications (Geographic Information Systems). For example, a public utility company user may want to connect power distribution lines to insulators on poles. This would re-quire the user to select successive points on the display with the cursor to indicate the sequence and place for the wire to be connected. The invention can prevent the user from inadvertently connecting the wire to trees, houses, sign-posts, and other points or objects that appear on the display.

Brief Description of the Drawings

The invention is described in detail by referring to the various figures which illustrate specific embodiments of the invention, and wherein like numerals refer to like elements.

FIG. 1 is a illustration of an application of the invention.

FIG. 2 is a flowchart depicting the operation of the invention.

FIG. 3 is an example of a type of database record useful in implementing the invention.

Description of the Preferred Embodiment

The embodiment of the described invention can be in the form of a subroutine. Subroutines are computer program modules that are not placed directly in the stream of instructions in which they are used. Subroutines are invoked by call and link procedures which cause the program execution to transfer to the list of

computer instructions comprising the subroutine program and to link or to supply the operands used by the subroutine. When a subroutine has completed execution, the program control returns to the instruction in the calling program following that which called the subroutine.

In the following description, references are made to the flowcharts depicting the sequence of operations performed by the program. The symbols used therein are standard flowchart symbols accepted by the American National Standards Institute and the International Standards Organization. In the explanation, an operation may be described as being performed by a particular block in the flowchart. This is to be interpreted as meaning that the operations referred to are performed by programming and executing a sequence of instructions that produces the result said to be performed by the described block. The actual instructions used depend on the particular hardware used to implement the invention. Different processors have different instruction sets but the person of ordinary skill in the art is familiar with the instruction set with which he works and can implement the operations set forth in the blocks of the flowchart.

Highlighting, as used in this specification, means to cause a selected entity to stand out from the surrounding entities on a display by changing its color, increasing or decreasing its intensity, blinking, reverse video, or the like.

In CAD applications, as well as in other computer graphics applications, editing commands are provided to operate on the graphic entities. For example, a TRIM function may be supplied for cutting off a line crossing another line so that the crossing line is terminated at the crossed line. FIG. 1A shows a crossed line 101 and a crossing line 103. When the trim function is selected by the user, a prompt is displayed such as SELECT TARGET LINE. In response to the prompt, the user can move a cursor to a desired target line, in this example, the crossed line 101 which is highlighted for verification. The user presses a button to select the highlighted target, or crossed line 101.

The system then supplies a prompt SELECT LINE TO BE TRIMMED. In response, the user moves the cursor to the crossing line 103 and, when it is highlighted, presses a button to select it. (In the example, the part of the crossing line on the side of the crossed line -- here the right side -- selected by the cursor is trimmed.)

FIG. 1B shows the displayed lines after the operation is completed. The crossing line 103 terminates at the crossed line 101.

If, however, as shown in FIG. 1C, the text is selected in response to the second prompt, the function cannot be performed because text truncation is not allowed. When the text is highlighted in response to the second prompt for verification, and is selected by the user's button, the system attempts truncation only to determine that the selected shape was text. The system then supplies an error message that the incorrect shape was selected.

The invention performs the sequence in a different order. When the cursor is on or near the text shape as the shape to be trimmed, the shape type is checked before highlighting to determine whether it is an acceptable choice. If not, then the text is not highlighted for verification and the user must move the cursor until a proper response shape is high-lighted.

Feedback to the option code is not done automatically when a correct entity is highlighted because the highlighted entity may not be the correct entity although of the same type. Feedback to the option is supplied only when the user signals, e.g., by pressing a button, when the high-lighted entity is acceptable.

A flowchart of the embodiment of the invention is shown in FIG. 2. A processing block 201 represents that an option code, i.e., a command or function, is being executed. In a processing block 203, a variable, SHPTYPE, is set to a shape type or some identification corresponding to the type of shape on which the option code operates. SHPTYPE can also include several shape types when the option applies to more than one type of shape.

An input/output block 205 prompts the user to select a displayed shape. When the shape is selected by the user generating a select signal, a subroutine block 207 represents that a subroutine is called. In the subroutine, a process block 211 determines the X,Y coordinates of the cursor. A process block 213 shows that the cursor location is correlated to the closest shape to the location of the cursor.

A decision block 215 determines whether this is a new shape or whether it had been previously selected during the subroutine. If it is not a new shape, the program returns to the process block 211 to check the next closest shape. If it is a new shape, the attributes of the selected shape are determined, such as by accessing a database record, as represented by a process block 217.

A decision block 218 determines whether the type of the selected shape is the same as the SHPTYPE variable. If not, the program moves to the output block 216 to cause another shape to be selected. Otherwise, the selected shape is highlighted as shown in process block 219 and the subroutine program returns to the option code as indicated by the process block 209. The decision block 218 may compare the attribute shape to several shape types included in SHPTYPE when the latter applies to more than one type of shape.

The above-described process is repeated after the user has been prompted to select another shape or when the next closest shape is selected.

A preferred implementation of the processes shown in the process blocks 211 and 213 are described in detail in U.S. patents 4,731,609 and

4,754,267, incorporated herein by reference.

A typical record entry for a database associated with the system being described is shown in FIG. 3. The first field is a shape number 301 which correlated to a selected display shape number. Next, a command list 303 is stored which can possibly contain several operations such as plot. Next, a vector list 305 is supplied which indicates the X,Y locations of lines and other data required to plot the shape. An attribute list 307 contains information as to the color of the shape, the shape type, whether the shape is filled, and so on.

When a shape is to be highlighted by changing the color, the color attribute of the attribute list 307 is changed and the shape is redrawn.

Similarly, by accessing such a record, the shape type can be retrieved from the attribute list 307.

While the invention has been particularly shown and described with reference to a preferred embodiment thereof, it will be understood by those skilled in the art that various changes and modifications in form and details may be made therein without departing from the spirit and scope of the invention according to the following claims.

Claims

1. A system for editing displayed images wherein editing is to be performed only on a certain type of image, comprising, in combination:
   means for selecting a displayed image;
   means responsive to said selecting means for determining whether said selected image is said certain type of image;
   means responsive to said determining means for causing selection of another image when said selected image is not said certain type of image; and
   means responsive to said determining means for highlighting said selected image when said selected image is said certain type of image.

2. The system claimed in claim 1 wherein said selecting means includes:
   moveable cursor means;
   means for supplying coordinates of said cursor means' location;
   means for referencing said coordinates to select a shape; and
   means for identifying said selected shape's type.

3. The system claimed in claim 1 wherein said determining means includes:
   means for ascertaining the certain shape type on which the editing to be performed; and
   means for comparing the shape type of said selected shape to said certain shape type.

4. A method for editing displayed images in a system including moveable cursor means for selecting displayed images, wherein editing is to be performed only on a certain type of image, comprising the steps of:
   identifying a selected image;
   determining whether said selected image is said certain type of image;
   repeating said identifying step for another image when said selected image is not said certain type of image; and
   highlighting said selected image when said selected image is said certain type of image.

5. The method claimed in claim 4 wherein the identifying step includes the steps of:
   supplying coordinates at which the cursor is located; and
   referencing said coordinates to select an image.

6. The system claimed in claim 4 wherein said determining step includes the steps of:
   finding said selected image's type;
   ascertaining the certain image type associated with the editing to be performed; and
   comparing said selected image type to said certain type of image.

7. In a graphics system displaying entities which can be selected by a moveable cursor, a method comprising the steps of :
   selecting operations to be performed on displayed entities, a selected operation identifying a type of entity on which the operation is to be performed;
   comparing the type of entity identified by the selected operation to the type of entity correlated to the moveable cursor; and
   highlighting the correlated entity only if the compared entity types are similar.

8. The method claimed in claim 7 wherein said comparing step includes:
   determining the moveable cursor's location;
   correlating the determined location to a displayed entity; and
   ascertaining the correlated entity's type.

9. The method claimed in claim 8 including the further step of:
   repeating the comparing step if the compared entity types are not the same.

10. System for editing displayed images comprising:

first means for controlling selection of a displayed image;

second means for controlling determination of a selected image's type;

third means for controlling designation of an operation to be performed on a certain type image;

fourth means for highlighting of a selected image only if the type of said selected image is the same as said certain type of image.

11. The combination claimed in claim 10 including:

fifth means for controlling determination of another image if the type of said selected image is not the same as said certain type of image.

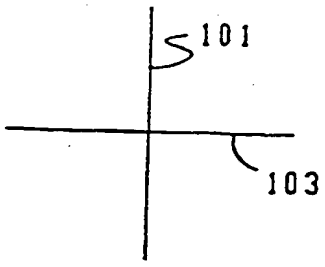

FIG.1A

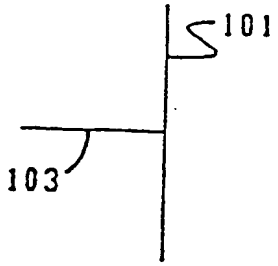

FIG.1B

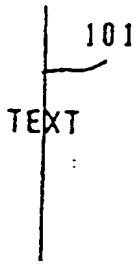

FIG.1C

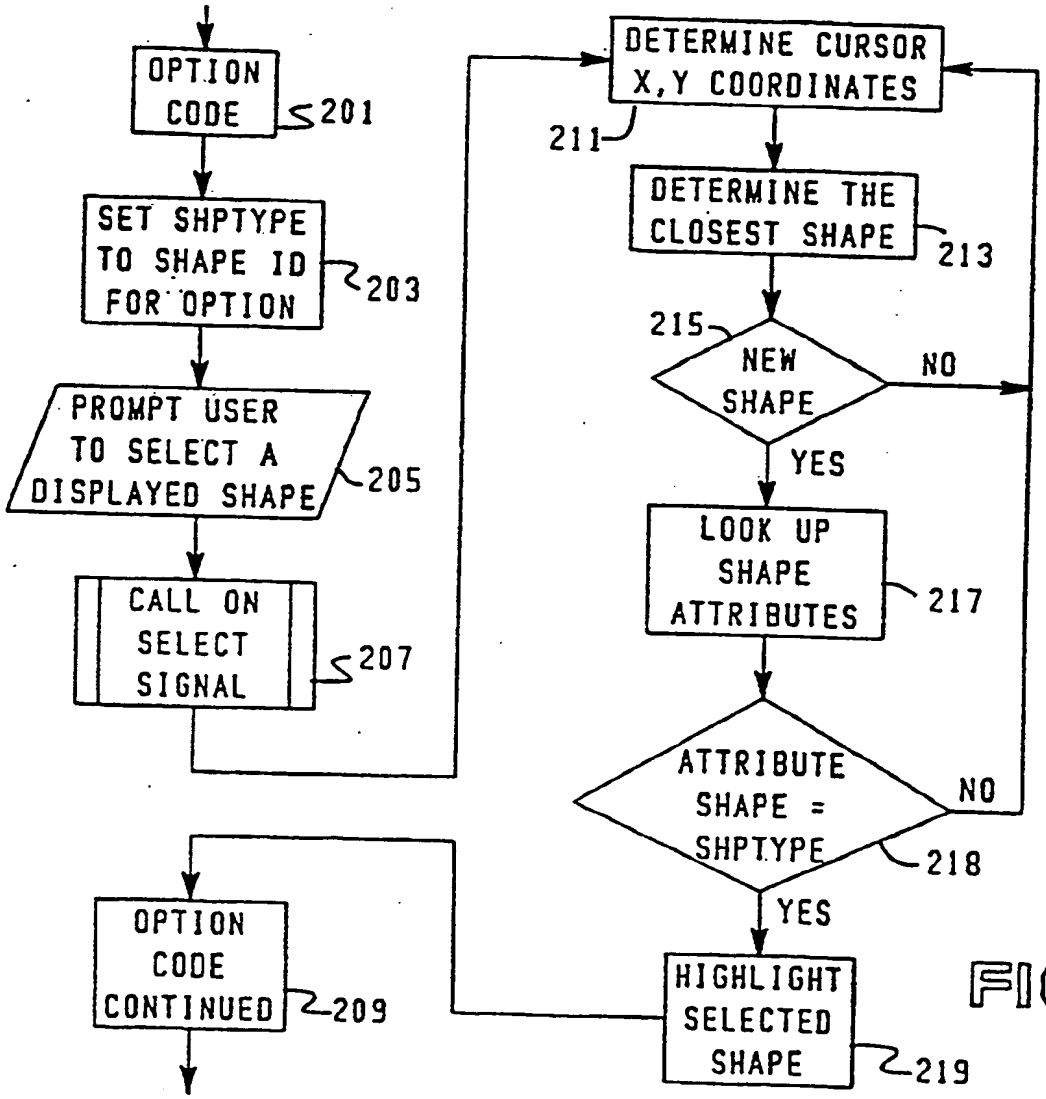

FIG.2

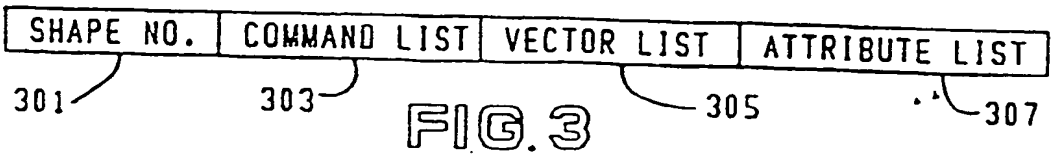

FIG.3